



THE WARRIOR

U.S. Army Soldier Systems Center

Natick, Massachusetts

March-April 2002



Pocket fare

See Page 3

Contents

3 *Pockets on hand*

Shelf-stable sandwiches approved for MRE menu.

4 *Blown arches*

Wide span shelter trades steel frame for air beams.

6 *Two-fer*

Improved Jungle-Desert Boot performs in either environment.

8 *Hard top*

Family of Cargo Bed Covers provides security and protection for equipment stowage.

10 *Enduring city*

Force Provider deploys to support war against terrorism.



Cover photo: A soldier holds a partially-eaten shelf-stable pocket sandwich, now approved for the Meal, Ready-to-Eat. (Warrior/Underhill)

**Deputy for Acquisition
and Readiness**

Col. (P) James L. Kennon

**Deputy to the Commander
for Installation Management**

John J. Manning

Command Sergeant Major

Command Sgt. Maj. Ira L. Daniels Sr.

Chief, Public Affairs

Jeremiah A. Whitaker

Editor

Curt Biberdorf

Staff Photographer

Sarah E. Underhill

The Warrior is published bimonthly by the U.S. Army Soldier Systems Center Public Affairs Office in Natick, Mass., and is available online at:
www.natick.army.mil/warrior/index.htm

The Warrior is authorized by Army Regulation 360-1. The views and opinions expressed are not necessarily those of the Department of the Army. Questions and comments concerning any articles in this publication should be addressed to:

U.S. Army Soldier Systems Center
Public Affairs Office
ATTN: AMSSB-OPA(N)
Bldg. 45, Kansas Street
Natick, MA 01760-5012
(508) 233-4300/5340
DSN 256-4300/5340

U.S. Army Soldier Systems Center
Internet links
<http://www.natick.army.mil>
<http://www.sbcom.army.mil>

Circulation: 2,750

*Printed by Document Automation and
Production Service, Natick, Mass.*

Pocket food

Shelf-stable sandwiches approved for Meal, Ready-to-Eat

By Curt Biberdorf
Editor

Pepperoni stick and barbecue chicken pocket sandwiches have been approved for the Meal, Ready-to-Eat (MRE).

The shelf-stable sandwiches were first developed by the Department of Defense Combat Feeding Program at the U.S. Army Soldier Systems Center (Natick) in the mid-1990s as a ration to enhance soldier mobility. They require no refrigeration or freezing, utensils or heat source before consuming, although they can be warmed with a flameless ration heater.

"What this gives us is something unique," said Dan Nattress, project officer. "We've combined shelf-stable bread that now supplements the MRE with meat into a lightweight, identifiable, eat-out-of-hand food."

Shelf-stable sandwiches are comparable to Hot Pocket sandwiches found at the grocery store in size, calories and appearance, but the major difference is in the processing that allows the food to meet the Combat Feeding Program's minimum shelf life requirements of 3 years at 80 degrees F or six months at 100 degrees F.

Military rations are commonly stabilized through thermal processing in retort pouches, but heat tends to destroy the flavor and texture of the sandwiches, said Michelle Richardson, also a project officer.

Instead, the sandwiches are developed using intermediate moisture technology. Products using this technology are preserved by controlling water activity and acidity levels. Humectants, which are substances that promote water retention, help lower water activity by reducing the amount of water available for bacteria growth. The pH or acid levels are controlled by choosing low-acid ingredients or incorporating natural acids into the product.

The amount of oxygen in contact with the food is also controlled by including oxygen scavenger packets. The sandwiches are packaged in tri-laminate pouches to prevent the transmission of water and oxygen, both necessary for the growth of yeast mold and bacteria.

"The combination of meat with the bread with differing water activities and pHs makes both safety and acceptability a concern," Richardson said. "The water activity of the different components needs to complement each other. If the water activity of the meat is too high, you may get soggy bread."

She said the shelf-stable sandwiches were acceptable to soldiers who tried them, and they meet Food and Drug Administration requirements for food safety.

The sandwiches are being further developed and commercialized under a Cooperative Research and Development Agreement with GoodMark Foods, Inc. in Raleigh, N.C. By partnering with industry, production costs should decrease while opening the opportu-



Warrior/Underhill

The barbecue chicken pocket sandwich is one of two varieties that will be issued in the Meal, Ready-to-Eat.

nity for sales in areas such as vending machines for anyone who wants a lightweight, nutritious meal that requires no preparation or silverware, said Nattress.

Other varieties under consideration are a pizza pocket with Italian sausage and pepperoni slices in a tomato sauce, sliced beef in a barbecue sauce, tuna or chicken salad, ham and cheese, and peanut butter and jelly.

"Just about any variety you can make with a Hot Pocket you can make with this," Nattress said.

The same technology is being applied to a new program in combat breakfast foods.

"The number of breakfast items available to the warfighter is very limited and not highly acceptable," Richardson said, who's leading the research. "The investigation of inter-component films and coatings may allow the use of ingredients previously impossible due to moisture or fat migration."

Some concepts that Richardson has proposed are cream cheese-filled bagels with and without fruit fillings, sausage and cheese biscuits, breakfast burritos with bacon and eggs in a tortilla wrap, and breakfast pizza. Prototypes are scheduled to be ready this year with production planned for 2004.



Warrior/Biberdorf

The Wide Span Air Beam Shelter uses braided fiber construction, the material composed of durable yet bendable Vectran fibers that give high load-carrying capability and necessary curvature.

Air support

Inflatable beams replace metal frames for wide span shelter

By Curt Biberdorf
Editor

Inflatable arches or air beams can “blow up” various military shelters within minutes, and give the Army and Air Force a faster, simpler alternative to metal frames.

The Wide Span Air Beam Shelter is the latest product using air beam technology to be demonstrated by the Fabric Structures Group at the U.S. Army Soldier Systems Center (Natick). The shelter—used for temporarily storing aircraft, vehicles and supplies—reduces logistics involved in providing field maintenance, and dramatically cuts the time it takes to set up and break down.

The Large Area Maintenance Shelter (LAMS) used since Operation Desert Storm takes 10 people a week to set up, but the air beam shelter will reduce that time to two days, said Jean Hampel, project engineer for air beam technology.

“When you need to rapidly deploy to follow troop movement or establish a port, you can’t wait a week,” Hampel said. “You need a sheltered environment, especially because today’s composite materials in aircraft require a protected environment for repair. With better maintenance and reduced downtime, the more aircraft you have available for the mission.”

Air beams for the wide span shelter reduce deployment time by 75 percent, weight by half and volume by a quarter compared to a similar metal frame shelter, but getting there was a challenge, according to Hampel.

Traditional commercial inflatable products, such as aircraft escape slides or inflatable boats, are constructed of flat coated fabrics cut and manufactured to the intended shape by stitching, adhesive bonding or thermally welding fabric pieces together. The technique is laborious,

and air seeps through seams and abrasions.

“(The products) feel squishy because they can’t go much over 5 pounds per square inch of air pressure,” Hampel said. “If you make (an air beam) too big, it ends up being as heavy as metal. If the pressure is too high, it can blow out.”

From the first low-pressure, leaning inflatable arches in the 1970s, engineers learned they needed to eliminate seams, reduce surface area, increase pressure and develop automated manufacturing processes.

They needed a high-strength sleeve, and the breakthrough came with braided technologies from Vertigo, Inc. and industry partner Fiber Innovations, Inc., and woven textile technologies from Federal Fabrics-Fibers, Inc.

Seamless, continuous tubular laminates can now be produced. The braided layers crossover at a slanted angle as opposed to a 90-degree

angle, stretching out when filled with air. The wide span shelter uses the braided fiber construction, the material composed of durable yet bendable Vectran fibers that give high load-carrying capability and necessary curvature.

Air beams contain an inner liner, much like a tire inner tube, to hold the air while a tough protective coating helps prevent damage and degradation.

Wide span air beam technology doubles the spanning capability of seamless air beam technology demonstrated in smaller shelters.

Tube pressure is now 30-80 pounds per square inch, with 80 pounds used in the wide span shelter for greater load carrying, Hampel said. The high pressure allows designers to make a smaller tube. Less surface area reduces the chances for leaking, and less material means a lighter weight.

High pressure creates a rigid structure under load, but it bends rather than breaks when overloaded. The 80-foot-wide and 33-foot-high wide span

shelter is designed to withstand 110 mph winds and hold snow up to 20 pounds per square inch.

Four people can set it up without the aid of ladders or other heavy equipment. Once the tent and air beams are rolled out, fastened to each other and anchored into the ground, an inflation system pumps up the tubes to its setup height in about an hour, Hampel said. Reaching final pressure takes slightly longer. Tubes at the ends can be substituted with metal poles to get most of the benefits of air beams without the extra cost.

Hampel said the goal is to transition the wide span shelter to Natick's Product Manager-Soldier Support for engineering development. This new air beam technology is already being used for the Chemically and Biologically Protected Shelter devel-

oped at Natick. Other related items under development include the Air Force TEMPER tent-sized shelter and the Small Tactical Air Beam Tent.

Beyond shelters, the inflatable technology has military and commercial applications for products such as munitions barricades, fuel or water containers, and space antennas.



Warrior/Biberdorf

A compressor fills the tubes and monitors pressure.



Warrior/Biberdorf

Tubes are anchored to the ground and inflate in about an hour.



Warrior/Biberdorf

At 80 feet wide, the shelter allows units to temporarily store aircraft, vehicles and supplies.

One better design for two kinds of environments is what the Marine Corps is getting with the improved...

Jungle-Desert Boot

By Curt Biberdorf

Whether in the Sahara or Amazon, the Improved Jungle-Desert Boot functions in both climates with more protection and comfort while saving cost and storage of two kinds of boots.

The new boot, developed at the U.S. Army Soldier Systems Center (Natick), was designed to replace existing black jungle boots and tan desert boots with a single advanced design, and the Marine Corps will begin fielding them at recruit depots in May.

“Marine Corps leadership wondered why they should have two separate boots,” said Michael Holthe, project officer with the Customer Support Team at Natick. “They wanted to have one improved

design. Ultimately, we have a more universal boot with improved safety and comfort for Marines.”

Jungle boots have gone through minor design changes since they were introduced in the 1960s and issued to troops in Vietnam. Smooth black leather at the bottom joined a thin, unlined green or black nylon upper half that is reinforced with an extra layer around the ankle. Two steel side-by-side screened eyelets on the inner part near the arch assist in draining water that fills the boots from inevitable pond or river crossings.

The distinctive black sole uses a self-cleaning tread with sharp outer edges leading to a smoother center portion. To prevent foot injury from bamboo traps in Southeast Asia, a

thin steel plate was placed inside the sole for puncture protection.

On the other hand, desert boots were introduced during Operation Desert Shield in response to the massive deployment of troops in the Persian Gulf.

The tan boots are composed of suede leather on the bottom with tan nylon on top reinforced by the ankle. A CoolMax liner helps wick moisture away from the skin. Eyelets are excluded to keep sand out, and the steel plate stayed out because troops complained that the jungle boot’s plates conducted heat. Desert boots have a tan rubber sole instead of black, but both have the same tread pattern.

Holthe said the Improved Jungle-Desert Boot was a part of the over-



Courtesy photo

Branded into the leather is the Marine Corps logo consisting of an eagle, globe and anchor. Fielding at the Marine Corps recruit depots is scheduled to begin in May.



Warrior/Biberdorf

A boot cut lengthwise shows the steel plate sandwiched in the midsole between pieces of fiberboard. It's far enough away from the feet to avoid heat build-up.

all changes to the Marine Corps desert and woodland camouflage uniforms.

The improved boot is made with nylon and rough-side-out leather that can't be shined. The olive mojavé color was chosen with care: It increases concealment by reducing the signature.

"The Marine Corps wanted to get away from black because it's an unnatural color. With night vision goggles, these tans are virtually invisible while black boots glow," Holthe said. "The shade fits in with the new uniform. It's green enough that it doesn't stick out in a jungle

environment."

Drainage eyelets from the jungle boots remain except that they have a finer screen to block sand while still being able to pump out water. Leather reinforces the ankles instead of nylon, and the CoolMax liner from the desert boots is included.

The Vibram outsole has a more common yet aggressive tread design that's now attached to a new shock-absorbing, cushioning polyether polyurethane midsole used in the Marine Infantry Combat Boot. Jungle and desert boots use only a durable rubber outsole.

"It's a lot more comfortable to

walk and run in, but it's not designed to just be comfy. Studies have shown that boots with this midsole reduce the incidence of lower-extremity injuries," Holthe said. "We're seeing an 80-85 percent approval rating from user evaluations, so we're happy about it."

He said puncture protection was still important, so a steel plate is sandwiched in the midsole between pieces of fiberboard. It's far enough away from the feet to avoid heat build-up. Inside, black padded removable insoles are standard equipment.

Four prototypes were evaluated by Marines across the country in North Carolina and California, and around the world in locations such as Japan, Peru and the Saudi Peninsula before the final boot design was selected. Further evaluation took place at Camp Lajeune and Twentynine Palms before the decision was made to start fielding.

Another reason the hybrid boot works well is because most of the user population doesn't need a specific boot, Holthe said. The Army will continue to issue and authorize separate desert and jungle boots.

One final touch leaves no doubt about the intended customer. Branded into the leather near the outer heel is the Marine Corps logo—an eagle, globe and anchor.



Warrior/Biberdorf

Drainage eyelets have a finer screen to block sand while still being able to pump out water.

Capped

Cargo bed covers now available for unit purchase

By Curt Biberdorf
Editor

Rigid covers for vehicle cargo beds and trailers developed at the U.S. Army Soldier Systems Center (Natick) are available for purchase through Soldier and Biological Chemical Command's Integrated Materiel Management Center.

The Humvee and M-105, 1 1/2-ton trailer covers are composed of a fiberglass-reinforced plastic con-

sisting of polyester fiber reinforced resin weighing nearly 450 pounds, while the 2 1/2-ton and 5-ton Family of Cargo Bed Covers are made with an aluminum skin and aluminum honeycomb core weighing nearly 700 pounds. The same aluminum covers fit on the Army's Family of Medium Tactical Vehicles (FMTV), FMTV trailer and the 800 or 900 series truck by altering the adapter.

The new cargo bed covers offer a lockable and environmentally-safe

alternative to bow and canvas or homemade wooden covers.

"They didn't have anything other than bow and canvas, which would leak and leave tools and other sensitive items unprotected," said Robert Rhine, logistics manager for the Shelters Team. "Soldiers would then often build their own plywood covers. These were often unsafe and not very durable."

Rhine, a retired Army chief warrant officer, served as a battalion maintenance officer and recalled how the weight of the plywood and two-by-fours built on trailers could easily reach the vehicle's weight limit before carrying anything. Another disadvantage is that the custom-built shelters can't be lowered to fit inside an airplane, so they would be left behind.

"Without a cover, there was nothing to keep tools and parts neat and orderly, and items could get stolen, tools especially," he said. "For the amount of money units spent on plywood for homemade covers, they could have bought several of these cargo covers."



Courtesy photo

A Medium Tactical Vehicle with an attached cargo bed cover is transported by a Chinook helicopter.

Product NSNs

Cargo Bed Covers can be ordered using the following National Stock Numbers.

Type I

Humvee: Woodland Camouflage 5411-01-467-3243; Desert Sand 5411-01-479-1928

Type II

1-1/2 Ton Trailer: Woodland Camouflage 5411-01-467-3185; Desert Sand 5411-01-479-1925

Type III

2-1/2 Ton Truck/LMTV: Woodland Camouflage 5411-01-472-7852; Desert Sand 5411-01-479-1932

Type IV

5 Ton Truck/MTV: Woodland Camouflage 5411-01-472-7857; Desert Sand 5411-01-479-1933



Warrior/Biberdorf

New cargo bed covers, such as the one attached to this Humvee, offer a new level of security and flexibility for equipment stowage.

The Family of Cargo Bed Covers for tactical wheeled vehicles and trailers store, protect and secure equipment, tools and other theft-prone items in a vented, weather-tight and lockable cube without interfering with the carrier mobility by ground, air or rail. The Cargo Bed Covers have been tested, approved and type-classified standard through Natick.

All cargo covers have two vents for interior ventilation. Troops can enter the cover through a lockable rear door and have cab access with

the Humvee. Six sets of nuts, bolts and washers are used to attach the Humvee cover through existing holes in the Humvee bed. For the trailer cover, eight sets of bolts, self-locking nuts and flat washers fasten through the sidewalls.

The larger 2 1/2-ton and 5-ton family covers are height-reducible for internal air transport on a C-130 or C-141 and have a two-piece lockable rear door. These covers are attached to its carrier with 16 bolts, self-locking nuts and flat washers. The Light Medium Tactical Vehicles



Warrior/Biberdorf

Humvee trailers get their own cargo bed cover.



Warrior/Biberdorf

Sets of bolts and washers fasten the covers to the vehicle bed.

(LMTV) and Medium Tactical Vehicles (MTV) require an adapter kit that allows mounting without modifying the cargo bed. Other features include roof steps and handholds for safe entry and exit.

All cargo covers have two 4-inch-diameter power and signal ports located on the forward side panels so soldiers won't have to leave a door open or drill a hole through the side as they did on the homemade covers.

They are painted white inside and can be ordered with a sand or woodland camouflage exterior. Furthermore, after units have the cargo bed covers, they can customize the interior with any variety of features, such as tool cabinets, shelves, workbenches, lights and fans.



Warrior/Biberdorf

Interiors of the cargo bed covers can be customized with toolboxes, workbenches, lights and fans.

Force Provider supports war

In a desolate area in the Afghanistan theater of operation, the U.S. Army Materiel Command (AMC) moved and set up a small “city” as part of Operation Enduring Freedom.

A product of the U.S. Army Soldier Systems Center (Natick), Force Provider was designed as a modular system of housing, food service, laundry, water and fuel storage and

distribution, waste-water collection, electrical power, showers and latrines.

Other items in the containers include religious support equipment, satellite television, sports equipment, free-weights, and board and card games intended to provide morale, welfare and recreation activities.

Each module, also called a “base-camp-in-a-box,” can serve 550

people, and three modules were assembled at the base camp in November.

Fifty people are needed to support the camp. The camp will generate up to 939 kilowatts of power every day, according to AMC estimates. It will daily burn more than 6,700 gallons of fuel, run nearly 62,500 gallons of water, and dispose more than 63,000 gallons of wastewater.

The high-tech tents are designed to keep the soldiers dry and seal out the cold air during the harsh central Asian winter.

Behind the scenes were crews working to ensure the base camp would be ready.

The Department of the Army gave AMC eight weeks to ship and set up the new camp, but AMC accomplished the task in nearly six weeks.

Active-duty soldiers and reservists in Europe and the United States moved more than 450 containers from storage sites in Luxembourg and the United States in November. They took hundreds of thousands of pounds of tents, power generators, water storage and distribution equip-



U.S. Army/Lynn Goddard

Truck drivers at Sierra Army Depot move containers of Force Provider materials to Reno, Nev., for air shipment by military and commercial carriers.



File photo

The \$5.4 million Force Provider module at Fort Polk, La., is used for training. Up to 550 soldiers can be supported by the base camp. A module was set up in the Afghanistan theater of operations last fall.



U.S. Army/Lynn Goddard

A “city in a box,” Force Provider containers are moved to a palletizing area in preparation for air shipment from Sierra Army Depot.

ment, and kitchens large enough to feed hot meals to more than 1,600 people three times daily.

Hundreds of containers sitting in storage in Albany, Ga., and Luxembourg were shipped to a staging area near Ramstein Air Base in Germany. Once in Germany, soldiers from the 21st Theater Support Command based in Germany and AMC’s Combat Equipment Battalion based in Luxembourg palletized the containers for military airlift to the Afghanistan theater of operation.

Sierra Army Depot in Herlong, Calif., was among the U.S. locations supporting the shipment of Force Provider. Operational Project Stocks material are stored and maintained at the depot.

“It’s been nonstop work and planning,” Jon France, Sierra’s transportation officer, said. “Support of soldiers with Op Stocks is 85 percent of what we do.”

A typical mission order was received just two days before large military and commercial cargo jets began landing to move badly needed materials to soldiers at an unnamed location.

More than 100 containers were checked, palletized for air shipment and loaded onto three Air Force C-5s and four contracted 747s.

“It took a cooperative effort to meet this mission because we did not have aircraft loading equipment to

side-load a 747,” France said. “We coordinated with the Air Mobility Command and the Nevada Air National Guard to meet all the aircraft staging requirements for this shipment of Force Provider.”

Civilian technical specialists from Natick were the first boots on the ground to orchestrate the construction of the base camp. They surveyed the site, designed the layout, organized site preparations, supervised shipment and receipt of the containers, and oversaw setup of the camp.

With AMC’s job completed, soldiers from the 542nd Quartermaster Co. (Force Provider) from Erie,

Pa., and 507th Corps Support Group from Fort Bragg, N.C., took over operations at the new camp in early December. They are responsible for sustainment operations, officials said.

AMC has been working on the Force Provider program for nearly seven years, sending modules to support Army humanitarian and peace-keeping operations in Honduras, Bosnia, Guatemala, Grand Turks Island, Haiti and Guantanamo Bay.

Editor’s Note: Lt. Col. Virginia Hart Ezell with the Army Materiel Command Public Affairs and Larry Rogers, public affairs officer at Sierra Army Depot, contributed to this story.



U.S. Army/Lynn Goddard

Sierra Army Depot ship containers of Force Provider equipment using an Air Force C-5 aircraft.